

Postoperative Bile Peritonitis

JOHN R. RYDELL, M.D., Santa Barbara

FOR MANY YEARS surgeons have been aware of the dangers of extravasation of bile. Fortunately this complication is rare, although there are many different mechanisms that may cause it. Bile peritonitis occasionally occurs following surgical procedures on the liver and biliary passages. In the medical literature surprisingly little attention has been paid to this problem. Unless promptly treated, such intraperitoneal bile collections can become extremely extensive and occasionally contribute to death.

ETIOLOGY

Congenital biliary tract defects may rarely necessitate an emergency operation on an infant to relieve bile peritonitis. Byrne and Bottomley⁶ cited the example of a three-weeks-old child whose peritoneal cavity was filled with bile. The source of the leak was a rupture of a congenital cyst in the region of the cystic duct. A somewhat more common cause of bile peritonitis is traumatic rupture of the liver, bile ducts or gallbladder. Norgore²⁰ collected reports of 32 such cases from the literature. Usually, of course, the extravasation of blood greatly exceeds in importance the spillage of bile. Neoplasms of the extrahepatic biliary passages may rarely grow in such a manner that perforation is caused by necrosis or increased intraductal pressure, with resultant leakage of bile.

Inflammatory lesions of the biliary passages are the commonest causes of bile peritonitis. Many cases have been reported of free bile in the peritoneal cavity without demonstrable perforation of the biliary tract. This so-called "biliary dew" is seen at any age. Hindmarsh¹² reported the case of a 22-month-old infant with free intraperitoneal bile and no visible abnormalities in the biliary system. The patient responded to surgical drainage, and subsequent cholecystograms were normal. Cope⁸ reported several cases of diffuse bile peritonitis without obvious perforation. Several other investigators described similar experiences. In many such instances careful study revealed tiny perforations, sometimes microscopic in size, to be the source of leakage.

Fletcher and Ravdin⁹ emphasized that perforation of an acutely inflamed gallbladder is uncommon. In

- Bile peritonitis may occur after open operations on the biliary tract or following needle biopsy of the liver.

Usually it is secondary to rupture of the common duct caused by overlooked common duct stone.

Sterile intraperitoneal bile collections may be tolerated fairly well for long periods.

Placing drains in the abdomen after biliary tract operations helps prevent dangerous accumulations of bile.

Patients with extensive bile peritonitis should be operated upon as soon as possible. Ideally, the operation should include drainage of the abdomen and repair of any underlying pathological cause, but the condition of the patient may be so poor that only drainage can be carried out at the moment.

a study of 2,807 cases of cholecystectomy over a 15-year period, they classified 600 as acute cholecystitis, and in only 44 of the latter did perforation occur. In 25 cases it was subacute perforation with pericholecystic abscess, in 14, chronic perforation with cholecystenteric fistula. In only five patients was there acute free perforation resulting in large amounts of bile and pus in the peritoneal cavity without evidence of localization. It has been my experience also that acute free perforation of the gallbladder is rare; I have seen only two such cases in recent years.

Rupture of the common bile duct is also occasionally the cause of bile peritonitis, even in cases in which there has been no previous operation. Chodoff and Levin⁷ collected reports of 14 cases of spontaneous perforation of the common duct. Usually a common duct stone is present, but Hart¹¹ and Moore¹⁶ independently presented cases of spontaneous common duct perforation without associated calculi or trauma or previous operation.

Postoperative bile peritonitis is likewise a rare entity. In a review of the literature, reports of fewer than two dozen cases were found in which sufficient bile extravasation occurred in the postoperative period to require a second laparotomy.

BILE PERITONITIS FOLLOWING OPEN OPERATION ON THE BILIARY TRACT

Postoperative bile peritonitis occurs most commonly following open operations on the liver, gallbladder or bile ducts. The ordinary mechanism is

From the Department of Surgery, Cottage Hospital, Santa Barbara.
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postcholecystectomy rupture of the common bile duct due to increased intraductal pressure resulting from an overlooked common duct stone. Wolfson and Levine²⁴ called attention to this problem by presenting reports of three cases of bile peritonitis following common duct exploration. In these cases reoperation was done and the abdomen was drained of large amounts of bile 32, 55, and 72 days after operation, respectively. In only one of them was the presence of residual common duct stone determined. Wolfson and Levine expressed belief that the usual cause of this complication was a subacute infectious process at the site of the choledochostomy. Newburger¹⁸ collected from the literature reports of nine cases of confirmed rupture of the bile duct following biliary operation which consisted of a choledochostomy in all but one case. All the patients were female, and all but one died of the complication. In a case observed by Newberger, reexploration of the abdomen was required 102 days after cholecystectomy and common duct exploration. Some 2,000 cc. of bile was evacuated from the peritoneal cavity, but the patient died four days later. Brunschwig⁴ reported two cases of postcholecystectomy rupture of the common bile duct, in both of which residual common duct stones had been overlooked. One patient died without opportunity for surgical correction of bile peritonitis, but the other recovered following laparotomy with drainage of a large amount of bile from the subhepatic area and removal of the retained stone.

McLaughlin¹⁴ presented an excellent review of the problem of bile peritonitis when he summarized eight cases. In three of them, reoperation to drain bile collections was necessary. Two of the three illustrate the risk of performing cholecystectomy without drainage of the abdomen; in both a secondary operation was necessary in the early postoperative period to evacuate intraperitoneal bile. McLaughlin emphasized that increased pressure within the biliary tree from overlooked common duct stones is the most frequent factor in production of bile peritonitis. Maguire¹³ reported a similar problem in a 57-year-old man who had to have two further operations to drain large intraperitoneal bile collections after cholecystectomy, despite drainage of the abdomen after the original operation. In the case of this patient the common duct ruptured on the fifth postoperative day, and months later a repair of a common duct stricture was necessary.

Postoperative bile peritonitis is occasionally confused with bile-stained peritonitis following gastrointestinal anastomosis. Bell and Warden² reported a case of a 39-year-old man who underwent laparotomy 48 hours after gastric resection for jejunal ulcer. No gross leak was found but 2,000 cc. of bile-colored fluid were evacuated from the abdomen, although no operation had been done on the biliary

passages. Apparently the color of the peritoneal exudate was due to leakage of the intestinal content.

Following is a report of a case of bile peritonitis probably due to overlooked common duct stone with leakage from a cystic duct stump.

CASE 1. A 71-year-old woman underwent elective cholecystectomy for gallstones in January 1954. At the same time repair of a small ventral hernia was done. Several medium sized gallstones were present but there was no evidence of acute cholecystitis. No aberrant ducts were noted, and the common duct was not opened. A Penrose drain was used. On the sixth postoperative day a large amount of bile drained through the dressings, soaking the binder and sheets. At this time a low-grade fever appeared, and it persisted. Bile drainage ceased at the time the drain was removed on the tenth postoperative day. The patient continued to have nausea, upper abdominal pain and distention. Occasional administration of narcotics was necessary. Although improvement was slight, the patient was sent home by ambulance on the seventeenth day after operation, partly at her own request. Bile was regularly present to some degree in the stools. Because of vomiting, weakness and increasing abdominal distention, she was readmitted to the hospital 31 days after operation. The next day a large swelling, apparently a collection of fluid, was easily visible in the upper abdomen. The patient complained of severe pain. Nasogastric suction did not relieve the distention. X-ray films of the abdomen showed haziness throughout the upper abdomen consistent with a large collection of fluid. The position of the Levine tube indicated that the stomach was remarkably displaced to the left and inferiorly by extrinsic pressure. There was no evidence of jaundice. The temperature varied from 99 to 100° F. Hemoglobin content was 9.9 gm. per 100 cc. of blood. Leukocytes numbered 13,650 per cu. mm.—70 per cent polymorphonuclear cells. Sedimentation rate was 93 mm. in one hour.

Because of the general progressive deterioration of the condition of the patient, laparotomy was done 33 days after the first operation. Local procaine block was used for anesthesia. The preoperative impression was of either pancreatic cyst or intraperitoneal collection of bile. When the abdomen was opened by a short left rectus incision, a great amount of intraperitoneal bile was seen. Approximately 6,000 cc. of it was aspirated over a 20-minute period. Immediately the patient felt better. Two large drainage tubes were put into the peritoneal cavity. Exploration of the biliary passages was precluded by the poor general condition of the patient. She was discharged to her home two weeks after operation. Bile drainage was still profuse, requiring several dressings a day. The pyloric obstruction and vomiting were promptly relieved by the operation. A mod-

erate external biliary fistula persisted for several months but the patient never became jaundiced and the stools were bile-colored. Common duct exploration was advised to find out whether there might be a retained common duct stone, but permission was not obtained. After four months the fistula closed and the patient continued in good health.

The following case was one of bile peritonitis probably due to spasm of the sphincter of Oddi with increased intraductal pressure and leakage from the site of a T-tube.*

CASE 2. A 35-year-old man was admitted to hospital October 17, 1956, because of pain in the lower back and upper abdomen. In a myelogram the following day no abnormality was noted. A cholecystogram showed a poorly functioning gallbladder containing several opaque stones. Cholecystectomy and choledochostomy were done as an elective procedure. The patient was not icteric. The common duct did not appear dilated but a small catheter was inserted into the cystic duct stump and was threaded into the common duct. Diodrast® was injected and an operative cholangiogram was made. Because of two small shadows appearing in the common duct, it was opened and explored directly. No stones were found and no pancreatitis or evidence of obstruction was seen. Two more operative cholangiograms were then made, the dye being introduced through a No. 10 (French) T-tube, and the final set of films showed no filling defects. It was assumed the shadows seen earlier were due to air bubbles. The gallbladder was thin-walled and was removed. It contained two stones, each about a half inch in diameter. No aberrant ducts were noted. On the seventh postoperative day another cholangiogram was made. No abnormalities were seen; the dye entered the duodenum promptly, and the caliber of the ductal system was normal. The following day the T-tube was uneventfully removed. Several hours later, during the night, the patient had extreme pain in the right upper quadrant with radiation into the scapular area. The pain was described as constant and knife-like, causing much restlessness and muscle guarding in the right upper quadrant of the abdomen. There was no drainage from the T-tube tract. The following day the patient complained of pleuritic pain, but there was no fever at any time during the day. Progressive improvement took place and he was discharged from the hospital the eleventh postoperative day, three days after removal of the T-tube. At this time the hemoglobin was 15.7 gm. per 100 cc. and leukocytes numbered 19,650 per cu. mm., 76 per cent of them polymorphonuclear cells. The patient was readmitted to the hospital the following day because of severe pain in the upper abdomen, associated with tenderness in the right upper quadrant. The skin was yel-

low. Leukocytes numbered 34,150 per cu. mm.—89 per cent polymorphonuclear. Serum bilirubin was 5.9 mg. per 100 cc. The alkaline phosphatase was 9.6 units (normal 1.5 to 4.0 units). Cephalin flocculation at 48 hours was negative.

X-ray films at this time showed an inflammatory process in the right lower lung field with compression atelectasis and some pleural effusion. The right hemidiaphragm was elevated.

During the next three days the temperature ranged from 100 to 101°F. and the pulse rate from 100 to 120. The general condition of the patient deteriorated and the abdomen became distended. On the sixteenth postoperative day, a right subcostal incision was made and a large collection of bile—about 1,000 cc.—was seen in the right upper quadrant, both above and below the liver. Several large Penrose drains were placed in this region and the abdomen was closed. No further exploring was done and no point of bile leakage was found. The patient's condition remained critical for several days but recovery gradually occurred, and the temperature was almost normal at the end of two weeks. A moderate amount of bile drainage persisted through the drains for several days. When the last drain was removed 12 days after the second operation, there was very little exudate from the operative field. The patient remained well.

As no calculi were found at the time of common duct exploration, and considering the normal cholangiograms, it seems unlikely that bile leakage might have been brought about by an overlooked common duct stone.

BILE PERITONITIS FOLLOWING NEEDLE BIOPSY OF THE LIVER

In rare instances bile peritonitis may occur as a complication following needle biopsy of the liver, a procedure that has come into wide use during the last decade. As with trauma to the liver from accidental means, the risk of hemorrhage is far more important and occurs more frequently than that due to bile extravasation.

Terry²³ in 1952 assessed the risk of this procedure in evaluating over 10,000 needle biopsies recorded in the literature. He computed a mortality of 0.12 per cent and an incidence of major complications of 0.32 per cent. In a series of cases in which he had carried out the procedure, severe bile peritonitis occurred in one instance. The patient was a 63-year-old man and laparotomy was done on the thirteenth day to drain 4,500 cc. of bile from the abdominal cavity. The patient recovered. Zamcheck and Klausenstock²⁵ in 1953 made an exhaustive survey of all reported complications of needle biopsy of the liver up to that year, reviewing more than 20,000 cases. It was their opinion that with the pro-

*Courtesy of Dr. W. H. Stephenson.

cedure properly done, the mortality rate was less than 0.1 per cent. Bile peritonitis was thought to be the cause in only four of 39 deaths. Schiff²² recently observed a case in which bile peritonitis following needle biopsy caused death. In none of these cases was the diagnosis made sufficiently early to permit laparotomy for drainage. Gallison and Skinner¹⁰ demonstrated clearly in a photomicrograph how the biopsy needle produced a fistulous tract 1.5 cm. long from a dilated intrahepatic duct. The patient died in seven days with 8,000 cc. of bile lying within the peritoneal cavity. In that case, carcinoma of the ampulla was found to be the cause of obstructive jaundice that had led to needle biopsy.

The following is a report of a case of extensive bile peritonitis, following needle biopsy of the liver, in which laparotomy was necessary for drainage.

CASE 3. A 76-year-old retired businessman had had cholecystectomy for gallstones 25 years previously. He had been quite well from then until about a year before the present illness, when he began having bouts of upper abdominal pain, fever and light jaundice, lasting usually two or three days. Upon physical examination, the liver was observed to be moderately enlarged. No abnormality was noted on x-ray examination of the stomach except for prominent angulation between the first and second portions of the duodenum, presumably the result of previous cholecystectomy. The blood sedimentation rate was 105 mm. in one hour. Total protein content was 8.1 gm. per 100 cc., of which albumin was 2.9 and globulin 5.2 gm. The serum bilirubin was 4.0 mg. per 100 cc. A subcostal liver biopsy was done with a Vim-Silverman needle. Two hours later the patient complained of pain at the biopsy site, and throughout the rest of the day dull pain persisted in the upper abdomen. Over the next four days the abdomen became progressively more distended and paralytic ileus developed. The leukocyte content of the blood increased from 6,250 to 24,250 per cu. mm. in 48 hours and the proportion of polymorphonuclear cells was 86 per cent. The temperature gradually increased to 101°F. A Harris tube did not decompress the abdomen, which became progressively more distended and tense.

Procaine infiltration of the abdominal wall was used for anesthesia because of the patient's semicomatose critical condition. When the abdomen was opened, bile gushed from it. The amount removed was estimated at over a liter and a half. A tube enterostomy was carried out to relieve some of the intestinal distention. Several Penrose drains were placed in the peritoneal cavity. Exploration of the biliary passages was precluded by the general condition of the patient. After a brief postoperative rally the patient lapsed into hepatic coma and in three days died of liver failure.

At autopsy an entirely unique situation was found. The common bile duct had undergone a complete stricture formation subsequent to the cholecystectomy that had been done 25 years previously. The dilated hepatic ducts at the hilus of the liver had spontaneously ruptured into the duodenum, and this small hepaticoduodenal fistula had functioned well enough to enable the patient to lead a normal life for over two decades. Numerous dilated intrahepatic bile ducts were present, and the biopsy needle had pierced one of these ducts near the surface of the left lobe of the liver; and this opening was the source of the extensive extravasation of bile. Severe portal cirrhosis was also present.

DISCUSSION

The three cases here reported illustrate the dangers of bile peritonitis. The fact that one of the patients survived despite accumulation of six liters of bile within the peritoneal cavity would indicate that sterile bile is not extremely dangerous. In certain cases, bile can be tolerated reasonably well in the abdominal cavity for long periods. Miles and Jeck¹⁵ among others, observed a similar situation and, in a study of the problem, carried out experiments with dogs. They expressed belief that the toxicity of the bile salts is one of the most important factors leading to death from bile peritonitis. Collections of bile can cause susceptibility to superimposed infection, they observed, due to the local necrotizing effect of bile on the peritoneum and viscera; and prognosis turned in great degree upon whether or not infection was present. Shock from fluid loss into the extravascular space may be of importance in certain cases, the investigators noted. The lethal dose of sterile bile injected intraperitoneally into dogs varied from 20 to 40 cc. per kilogram of body weight.

When bile is spilled into the peritoneal cavity, the resulting inflammatory reaction will produce exudate from the peritoneum, which dilutes the bile. As was pointed out by Ravdin,²¹ bile ascites must be differentiated from bile peritonitis. A relatively small amount of bile can discolor a large volume of peritoneal effusion. Bowers³ reported the daily removal, by paracentesis, of 5 to 6 liters of bile-colored fluid, obviously a far greater volume than the daily total bile production by the liver.

Much debate has taken place with respect to the importance of drainage of the abdomen after cholecystectomy. Some skilled surgeons rarely place drains in such cases, but the majority are agreed that the use of drains affords additional protection against postoperative bile leakage. I routinely place drains in all cases of biliary tract operation.

Possible causes of postoperative bile extravasation

include rupture of the common duct due to obstruction or infection, leakage from accessory hepatic ducts, failure to drain the common duct after exploration, unnoticed trauma to the bile ducts, slippage of the cystic duct ligature, and partial dislodgment of the T-tube. A significant contribution was made by Allen and Wallace,¹ who emphasized that a watertight closure of the common duct is extremely difficult to obtain. Bile drained into the dressing in all but one of 28 cases in which the common duct was closed tightly without T-tube or catheter drainage. Without free flow to the outside, some degree of bile peritonitis would invariably occur.

The following cases illustrate the potential creation of bile peritonitis, but adequate drainage permitted the bile to localize its exit as an external biliary fistula. Omitting drainage would certainly have resulted in serious complications and possible disaster.

One was a case of postcholecystectomy rupture of the common duct due to an overlooked stone.

CASE 4. A 65-year-old housewife with severe diabetes and Paget's disease, had cholecystectomy for subacute cholecystitis with cholelithiasis. The operation was more difficult than usual because of inflammation and an anomalous double hepatic artery which overlay the common duct. She had three attacks of biliary colic in the immediate postoperative period, associated with mild icterus. The Penrose drain was removed in one week as there was no unusual drainage. The patient went home nine days after the operation. On the twentieth postoperative day, bile began to drain through the former site of the Penrose drain, and a complete external biliary fistula developed. A fistulogram was made by injecting Diodrast and an impacted stone was outlined at the ampulla of Vater and a second stone in the hepatic duct. Choledochostomy was done and the two stones were removed after a transduodenal sphincterotomy. The patient recovered.

The other case was one of prolonged external biliary fistula from an accessory hepatic duct after cholecystectomy.

CASE 5. A 44-year-old housewife had cholecystectomy because of a tense subacutely inflamed gallbladder containing multiple stones. The common duct was not explored. An accessory hepatic duct that originated at the gallbladder bed in the liver and entered the gallbladder near the cystic duct was ligated with catgut. Convalescence was normal until the eighth postoperative day, 24 hours after the Penrose drain had been removed. Suddenly bile gushed from the drainage tract which continued as an incomplete, although large, external biliary fistula. The patient went home on the seventeenth postoperative day. Profuse bile drainage continued for

nearly two months, and then stopped rather suddenly just when preparations were being made to reopen the abdomen. During this time bile was also entering the intestinal tract, indicating there was no obstruction of the common duct. The patient thereafter was in good health.

In both of these cases, generalized bile peritonitis might have developed if drains had not been placed after cholecystectomy. Fortunately the drains were left in place a full week after operation, because the bile leak did not occur until the eighth day in one, and the twentieth day in the other. It is quite likely that bile extravasation of minor degree often stops spontaneously. Drainage of enough bile to saturate the dressings for a few days after cholecystectomy is not unusual and does no harm unless large amounts stay within the abdomen. Usually drainage of this kind is owing to leakage from tiny accessory hepatic ducts that were severed fortuitously as the gallbladder is being removed from its bed in the liver.

DIAGNOSIS AND TREATMENT

Whenever a patient who has had biliary tract operation does not progress satisfactorily in the immediate postoperative period, the possibility of bile peritonitis should be considered. Undoubtedly many more cases occur than are reported. The symptoms of increasing abdominal distention, nausea and dull pain in the upper abdomen should warn of the possible extravasation of bile. Usually the number of leukocytes increases rapidly and out of proportion with the low grade fever. If a tube has been placed in the abdomen, it should be loosened to ascertain that it is not damming rather than draining. If fluid formation is considered likely in the postoperative period, it is well to place a catheter inside the Penrose drain to facilitate drainage. When doubt exists as to the diagnosis, aspiration of material from the abdomen with syringe and needle might provide a clue. X-ray visualization will occasionally show an elevated hemidiaphragm and other signs suggestive of subphrenic abscess, possibly due to bile leakage.

Bile extravasation in the postoperative period will usually not be manifest for a week or more. In most cases in which reopening of the abdomen becomes necessary, the operation is done from two weeks to two months after the initial operation. Some of this delay may be due to failure to recognize the possibility that extravasation of bile is taking place; and delay may be disastrous.

It seems clear that patients with extensive bile peritonitis should have surgical drainage at the earliest possible date. Often the general condition of the patient is so poor that only drainage of the abdomen can be done and exploration of the biliary

passages must be put off. Simple abdominal drainage is technically easy and can usually be carried out with only local anesthesia. It will relieve the emergency and in some cases may be all that is necessary. However, in most instances further exploration of the bile ducts must be done to find the source of leakage and the underlying cause.

233 West Pueblo, Santa Barbara.

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